

SCIENCE

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THUNDER-STORMS.

A TYPICAL thunder-storm is first seen as a dense, ragged cloud in the west, extending to a height of over a mile. The sky is entirely clear elsewhere, except sometimes covered by a light fleecy veil of cirrus. The cloud in the west rapidly enlarges, and completely covers the sky except a small portion to the east and south-east. The motion of these clouds is distinctly from the west and quite rapid, while the surface wind is from the south and quite gentle. This wind is blowing toward a general storm situated about five hundred miles to the north-west, and has no connection at all with the thunder-storm which is suddenly interjected, as it were, upon the quiet air. Often there are seen two clouds in the south-west and north-west which seem to meet together and produce the storm, but more often the first appearance is that of a great cloud of dust borne upward about three hundred feet, and advancing with great rapidity from the west (sometimes eighty miles per hour). Some of the clouds sprinkle a little rain as the dust-cloud advances, but this is very light. When the storm is very severe, a loud roar is heard like the continuous discharge of electricity which produces a steady instead of intermittent thunder. During this time, lightning-flashes are seen and distant thunder heard. In a few moments, after the dust-cloud has approached nearer and practically with it, the wind suddenly whirls to the west, and blows with great velocity (sometimes eighty miles per hour). Then, in a moment or two more, the lightning and thunder become very intense, and rain falls in torrents. Often the lightning's flash is the signal for a fresh downpour, allowing a few seconds for the fall of the rain from its height. This phenomenon has led to the view, now almost universally accepted, that there is a most intimate relation of cause and effect in this display of electricity and the subsequent rain. Under some circumstances, but invariably in connection with this heavy rain, there fall hail-stones variously measured from the size of a pea to that of hen's eggs, and even larger. In some cases, larger masses, even as great as an elephant, have been reported, but these are due to a mingling or freezing together of many stones in the air or after they reach the earth.

Cold Air.

During the progress of a thunder-storm, and after its front has reached the observer, there is a remarkable cooling of the air. This cooling seems to arise from a downward current in the centre of the storm. It cannot be due to the onrush of a north-westerly wind, for that must come from a warm region, since the thunder-storm has been suddenly interjected into a region of warm southerly winds flowing for hun-

dreds of miles toward the north. This cooling is often very great, and seems to indicate that the air in the centre of the storm is not abnormally heated, as in the case of a general storm, but is very much cooled. The bearing of this upon the generation of the thunder-storm is of great importance, and does not seem to have been sufficiently considered.

Environment.

When the storm passes to the north or south of the observer, there is quite a brisk breeze from it, showing that the motion of the air is from it on at least three sides. Often it is possible to view the storm, in its onward progress, with clear sky overhead, if its border does not reach the zenith of the observer. Under these circumstances, one sees very distinctly up to the highest clouds a steady motion to the east. The rain is seen falling in great sheets, and its front is very distinctly marked. This rain front seems to be an important phenomenon, and has been seen scores of times advancing with a slight lagging at the earth and in the clouds. The appearance impresses one at once as caused by a rapid motion in the middle cloud region, with a lagging at the earth possibly from friction, and in the upper part of the cloud from a less velocity at that point. In no instance has there ever been observed an uprush of air anywhere in this region. These storms go in parallel lines; and as many as four have been seen running one behind the other, the most northerly one in advance. Often it is reported that a storm has gone slightly north of a station, and then turned and come back directly over it; but this is probably an illusion. The second storm has a motion the same as the first, but goes a little farther south. The motion across the country of these storms is about double that of the attending general storm to the north-west.

Probably the most marked characteristic of a thunder-storm, however, is a rise in pressure at its centre. This rise is universally conceded to-day, though its cause is in grave doubt. It has been repeatedly observed in storms where there has been no rain, and hence cannot be due to the cooling of the air by the rain, or to its downward pressure as it falls. How is it possible to account for this rise of pressure in a storm which is itself travelling more than a mile a minute? We have here to consider a phenomenon entirely distinct from a sand-whirl of the desert, which has only a slight progressive motion. There seems to be no doubt whatever that we are to consider here a cause or a condition which is inherent in the storm itself. There can be no upsetting of the equilibrium, no uprush of air just in front of a thunder storm and nowhere else, which could give such a rise of pressure in so rapidly a moving body of air. We are cer-

tainly dealing here with a *plenum* which moves with the storm, and in fact is the storm itself. It may not be that this is due to a downrush of air-particles from some height; but there is no serious difficulty in assuming that, through electrical action, there is an increased pressure in the centre. It is plain that the foregoing description has a most marked parallelism with that already given of the tornado, and it is virtually admitted that a tornado is simply an extreme development of a thunder-storm.

The attempt to show that while these phenomena are alike in most respects, and yet that in one of the more important factors they are entirely distinct, is most remarkable. We are taught that the origin of both is an unstable equilibrium, in both there is an uprush of air, in both there is a cloud of dust, in both there appear to be two clouds meeting from the north-west and south-west, in both there is a loud roar heard oftentimes, and in both there is a pronounced cooling. They are exactly alike, and produced the same way, but the final result of these actions is to develop two entirely dissimilar and almost opposite conditions. We are told that in a thunder-storm the air starts upward in the centre, has its moisture condensed by expansion, and the resulting precipitation cools the air, increases its density, and finally the diminished pressure at starting gives way to an increased pressure from this change in the density. It must be admitted that this is a reasonable conception, and may be true; but would not this at once destroy the ascending current, and bring the whole action to a standstill? Can we for a moment have both uprushing currents in a storm-centre feeding its energy, side by side with downrushing currents increasing the pressure? It is only necessary to state this contradiction in order to show the absurdity of the hypothesis. This theory strikes at the root of the whole process of liberation of energy in a moist ascending current; but, more than that, if there is such a cooling and subsequent downrush, why should it not act in precisely the same manner in a tornado? How is it possible for this same uprushing current, which starts in exactly the same way in both these conditions, to continue upward in a tornado, to gather energy as it rises, to liberate more and more latent heat, to rush faster and faster, to grow warmer and warmer, and finally to produce the violent tornado with its supposed almost perfect vacuum in the centre, where a half-mile away there is perhaps a thunder-storm causing an increase of pressure? It would seem as though there could hardly be a plainer exposition of the utter futility of all the attempts that modern theorists have made to grapple with this problem than this latest attempt to start the thunder-storm and tornado in the same direction, and finally bring them out, from almost the same conditions, facing in opposite directions, and absolutely dissimilar in their most essential characteristic.

Explosive Effects.

Is it possible for electricity to produce a sudden increase of pressure in a mass of air sufficient to violently rend asunder objects which it strikes? Oftentimes the bark of trees has been driven off; and the usual explanation of this has been, that the heat of the electricity has converted the sap into steam, and this in turn has forced off the bark. This, however, is not satisfactory, for the reason that even a dead and perfectly dry tree has been struck, and scattered over a

large field. A remarkable instance of explosive action in a lightning discharge is to be found in *Nature* for May 8, 1890. A tree standing in a rather open field was struck by lightning, and its fragments strewed over two acres of ground. One solid piece weighing five pounds and a half was thrown three hundred and seventy-eight feet. Other *débris* lay two hundred and ten feet in another direction. Small pieces of riven trunk and bark were found thrown in the teeth of the wind and one hundred and eighty feet from the tree. The concussion or increase of pressure smashed six fine glass window-panes in a house not far away. Another very interesting effect was noted in a house that was struck in Washington, D. C., Aug. 23, 1885. In this case the lightning struck the south-west corner of the tin roof on an ell built on the south side of the house, and divided. A portion of the flash passed down an eaves-spout; and at its end, which was two or three feet above the ground, it passed through the air to the damp side of the house, knocking off the plastering on the inside. The other portion of the flash passed down between the weather-boarding and the plastering on the east side, shattered one of the upright posts, and appeared to explode off the weather-boarding toward the east, and the plastering toward the west. A woman and her two sons were apparently stunned by the effects.

While such cases have usually been regarded as "freaks" of lightning, yet it would seem that the matter has not been sufficiently studied to enable us to determine just what effect such a discharge would have upon a confined air space. It may be, the apparent bursting of a house in a tornado may be accounted for in this way. An instance has already been given at St. Louis of a rise in pressure, as shown by a barograph, and at the same time a seeming bursting of houses. Hardly a month passes that there is not some discovery regarding this extraordinary force of electricity, and surely we are not in a position to deny that it might not produce a large number of effects now observed in a tornado, such as searing of green leaves, discoloring the trunks of trees, increasing the pressure, exploding houses, depluming fowls, etc. We are told that lightning-flashes are seldom seen in a funnel-cloud. They have been seen there many times. Moreover, it is not at all certain that an ordinary observer would be in a condition to take particular notice of the presence of electricity in a tornado; and, again, the electricity may pass down or up the funnel without a visible flash. The presence of ozone has been often noticed in a tornado where no lightning was seen.

Possibilities of Electric Action.

It has been my purpose for many years to avoid, as much as possible, all speculations in considering air motions and the causes of atmospheric phenomena. This is especially pertinent when we consider electric action in the atmosphere. It is very difficult to believe that electricity has nothing to do with our thunder-storms, and is merely a result, and never a cause. The fact that physicists have never yet been able to account for more than the smallest fraction of atmospheric electricity should lead us to greater diligence in determining its methods. We know from observation that the electric potential is enormously increased as we ascend in the atmosphere. That little or no connection between atmospheric electricity and storms has been observed

by our instruments near the earth is not remarkable, since the earth and air just above it may neutralize all electric action for a hundred feet or more. Our thunder-storms seem to show an enormous storehouse of electricity at five thousand or six thousand feet above the earth; at least, electricity seems to be concentrated there over thousands of square miles during thunder-storm action. We are taught that electricity forms a sort of dual condition, or the electric field is a double one. May not this electric field draw on the sun for its energy? It is believed that light, heat, and electricity are all different manifestations of the same radiant energy. The abundant source of this energy is the sun. Why may not the sun's electricity, oftentimes observed by its direct effect on our magnetic instruments, and more often still indirectly in our auroras, be intercepted by a peculiar condition of the atmosphere or of the earth below, and thus be concentrated in particular localities? Generally this electricity passes through the air to the earth, but must we think that it always does so? May not this electric field or dual condition gradually develop in the atmosphere largely independent of the passage of air-particles through wind or convection currents?

The Electric Field.

For convenience it has been generally considered that particles have a tendency to leave the positive and pass to the negative pole. For example: in the electric arc-light the carbon at the negative pole is built up at the expense of the positive. The velocity of transmission of these carbon particles perhaps cannot be determined, but it must be only a very small fraction of that of electricity, 190,000 miles per second. Is there any inherent improbability in the supposition that in this dual condition in the atmosphere there is a tendency for moisture and possibly dust particles, positively electrified, to pass rather rapidly from the positive pole, or, better, positive portion of the electric field, to the negative portion? We know from observation that during the passage of a high area or clear sky the electric potential, with very few exceptions, becomes markedly positive, while during the fall of rain it is negative. While a thunder-storm is passing, there are most violent fluctuations of the electrometer-needle from negative to positive and back again, as each flash of lightning is noticed. These fluctuations of the needle are perhaps a hundred times as great as under ordinary conditions of rainfall, and take place when the flash is a mile or two away, showing a most extraordinary inductive action upon the atmosphere, and for enormous distances. We have positive evidence of such transmission of moisture-particles by a force entirely distinct from heat, pressure, or any other commonly recognized meteorologic condition. It is known that the moisture in the air is one of the most constant elements we have to deal with. The temperature may rise and fall thirty or forty degrees during the day, and yet the quantity of vapor is in no wise changed. The wind, either in direction or velocity, does not change this moisture. The hiding of the sun's heat or light in no wise affects it. Changes in air-pressure produce no effect in general. As a storm approaches, however, we find a most marked increase in this moisture over thousands of square miles, and this even in a calm. As a storm passes off, the conditions are sharply reversed. The moisture becomes depleted in a most remark-

able manner, as though it were actually drawn out of the atmosphere by an invisible agency.

The most remarkable example of such action was observed on Dec. 22, 1889, from a third-story window of a house in Washington. It will be seen that the conditions were not favorable for observing this effect at its best. At 3.11 P.M. there were 4.09 grains per cubic foot, and for more than twenty-four hours previous there had been an abundance of moisture from a storm passing near by. The air was almost a calm, and continued so till nightfall. At 5.2 P.M., or one hundred and eleven minutes later, there was only 1.04 grain per cubic foot, and this continued as long as observed. To any one who has made determinations of the moisture of the air, and noted its great constancy, frequently for several days, this sudden subtraction must be very extraordinary. If such changes are possible near the earth, and in the centre of a large city with houses for more than a mile on all sides, what may we not expect to take place in the free air, where there are no interferences, and where we know that such forces are acting in far greater intensity than near the earth?

Enormous Fall of Rain.

Just after a thunder-storm or tornado, there are torrents of rain, and in some quarters it is getting to be quite the custom to call such phenomena cloud-bursts. In these cloud-bursts almost an incalculable amount of rain falls, more than a foot having been reported at times. In one case four feet of hail were reported. Just how much territory is covered by such a cloud-burst cannot be told, as the data are not sufficiently numerous, but fifty or sixty square miles may be easily considered. We have already seen that the later theory, which calls for a downrush in the centre of a thunder-storm, effectually disposes of all possibility of this enormous amount of moisture rushing up in the centre and being condensed by expansion. In the case of a tornado, it is incredible that even a thousandth part of this moisture can be carried up in a funnel a few hundred feet in diameter. If we inquire what would be the effect of the ordinary condensation of such a mass of water in the air over such a limited space, we are confronted by an amount of heat set free that is simply appalling. One gallon of rainfall gives out sufficient heat to melt forty-five pounds of cast iron. A very little consideration will show us that it is absolutely impossible, even allowing a current of moist air at any conceivable velocity, for even a small fraction of rain to be precipitated out of such a current. It has already been shown that the latent heat set free would at once re-evaporate the moisture. We seem to be driven to invoke the aid of some other agent than any thus far recognized as cogent in producing our storms. Is it inconceivable that we have to deal here with a negative electric field, which draws to itself with great velocity particles of moisture from regions perhaps for one hundred miles about, when suddenly, upon a discharge of electricity, the potential upon the particles is diminished, and they unite in great abundance and form raindrops? This is a most inviting field for observation. We already have facts enough to make a plausible hypothesis, and, what is very important, we have here an unlimited amount of energy which may be called upon to produce all the effects ever observed.

It is not a little remarkable that the earlier views all ascribed tornadic action to electricity, and it would seem as though the time were not far distant when we would be forced to return to this agent for explaining the phenomena. What are needed are careful experiments in this most enchanting field of research. An attempt has been already made to test the question of the transmittal of moisture through the air by electric action. A Holtz machine was run for fifteen minutes in a rather large room; and most careful measurements of the amount of moisture at the machine and at a point twenty feet away, before and after the machine was in action, showed an increase at the machine. When we consider that it was impossible to measure the moisture contents just at the plate of the machine, and also what an extremely slight charge could by any possibility enter the air from the machine, we can but be surprised that any effect at all was observed. With improved methods of observation by which the exact hygrometric state of the air can be easily and accurately determined, and with very accurate tables of reduction which we now have, all that is required is an observer for investigating these phenomena. The expense for apparatus need not be great.

H. A. HAZEN.

CUSTOMS OF COURTESY.¹

Few ceremonial customs have originated in recent times. Their forms, whether now trivial or still important in sociology, are vestiges of the past, and only by anthropologic studies are traceable to their genesis and early form. All authorities, unswayed by a religious or theorizing bias, agree that in the origin of these ceremonies there was nothing designed or intentional; that is, they were not directly invented with definite purposes. A thing is not now and never has been customarily done because it is intrinsically right, but is considered to be right after and because it has been habitually done, whatever its origin or the circumstances in which it prevailed.

The rules of courteous behavior as they now exist are not the immediate effect of deliberate conventions, but are the natural and slow product of the forces gradually developing social life, and they exhibit the laws of evolution with as great distinctness as is demonstrated in the physical realm. Men have not fabricated though they have framed rules for themselves. They have fallen into the customs from which rules were framed, and then by unintended modifications have deviated into novelty and new rules.

To the query "Why do nations and peoples do any thing as a custom?" the optimist answers, "Because it is right;" which assumption yet further confuses the vexed question whether, in the nature of things, there is an absolute right and an absolute wrong; for customs vary even unto opposition in different parts of the world, and not only in different, but in the same, periods of history; so that they cannot all be absolutely right. In matters large and small, vital and trivial, what is esteemed as virtue and merit at one place and time, is condemned at others as vice and crime. Explanation has been attempted on the theory, that, there being distinct races of men, each of them has its idiosyncrasy; indeed, that by primordial decree each of them had the mission to do certain things, and no others. By such theory, fatalism is omnipotent, and all men are marionettes. But this explanation depends upon a conceded classification of men into races, which has failed. A few years ago, school-boys glibly recited the titles of the races of men, with their characteristics; but now students who have devoted long lives to the subject find such classification to be so difficult that no two writers agree. This does not indicate the proposition that there are no distinct races of men; indeed, it is possible that once there were many more

races than have ever been recognized, the present condition being one of amalgamation. But the plot of the marionette show becomes confused when there is no agreement about its personages.

The chief justice of a high court lately declared that no race of men was good for any thing which had not believed in only one God, and allowed only one wife. As all the races of men have at some time believed in many gods, and have allowed a plurality of wives, this dictum would condemn all; but it is an example of hysteron proteron, or "the cart before the horse." If the statement had been that polytheism and polygamy were outgrown before the attainment of high culture, it would have been historically true; but as made, it is as inaccurate as to assert that no race is good for any thing in which the men have not always worn trousers,—a useful but recent invention of civilization. Instead of seeking an explanation of customs in race, it is more practical, as well as more scientific, to look for it in habitat and history; i.e., in environment.

An apparent exception occurs in the arbitrary edicts of fashion, styled very properly by Borachio as "a deformed thief;" but a distinction may readily be made between custom and fashion. Fashion is imitation and transitory. It is most commonly noticed in details of dress or ornament designed by some influential person to conceal a defect or display a beauty; sometimes, however, in latter days, by a conspiracy of manufacturers, tailors, or milliners. With the cessation of the special influence, the imitation gradually declines, unless, indeed, genuine merits are discerned in the invention, in which case it is assimilated through the vital catalysine faculty. The method of human progress is empirical. The good and useful, when ascertained by experiment, are retained for further improvement throughout the ages, while the noxious or useless are sooner or later rejected.

The views submitted dissent, though meekly, from some details in the work of that great writer and thinker, Herbert Spencer. No one can deny his comprehensive grasp of intellect, his brilliance of style, and his wealth of illustration, but more especially the wonderful and far reaching suggestiveness by which he has awakened and guided modern thought. Yet he is more beneficent as an educator of the mind than as an instructor in facts. In particular, his most admiring student must lament the Zoroastrian phantasy or dual antagonism of good and evil that mystifies his principles of sociology. To him militancy is Ahriman, and industrialism is Ormuzd, and their conflict is forced to explain all the myriad problems of human life. But the known causes and effects are too numerous and diverse to be disposed of by one universal solvent. The complex knots must be patiently untied, and cannot be severed by the rusty sword of a vamped and varnished Parsee dualism. Nor does history confirm this prosopopeia of good and evil. Industrialism began very early, and among the most cultured nations is now in a high state of development; yet it exhibits within itself strife and turmoil, selfishness and cruelty, equal to all the similar crimes ever charged against militancy. The latter has by no means passed away, though the human race has surely advanced. In fact, an evolutionary advance is manifest in militancy itself parallel with that seen in other lines of thought and action. Militancy, therefore, is not the cacodemon by whose overthrow alone the world has grown better.

The verbal forms of salutation may be divided into (1) those of a purely religious character, (2) those equivalent to a prayer for the health and temporal good of the person saluted, (3) those simply wishing health and prosperity without direct invocation of a deity, and (4) those expressing personal or official affection or respect.

1. The Israelites, both in meeting and parting, used a word meaning "blessing," and the person addressed was thereby commended to God. The expressions "Blessed be thou of the Lord!" and "The Lord be with thee!" are traditional.

The Arabian often says, "God grant thee his favors!" also "Thank God! how are you?" and the Turk, "My prayers are for thee," or "Forget me not in thy prayers." In Poland a visitor to a house will cry out, "The Lord be praised!" to which the hostess will answer, "World without end, amen!" The "sweet girl

¹ Abstract of the leading article in the American Anthropologist for July, 1890, by Garriek Mallory.

graduates" of conventual schools in this country involuntarily answer a knock at their doors by the word "Toujours!" instead of "Come in!" through the habit formed when the sister at the convent dormitory door uses a formula in praise of the Virgin Mary, to which the obligatory response was, "Forever!" Very lately a similar custom prevailed throughout Spain by which the visitor ejaculated "Maria purissima!" the reply being "Sin pecado concebida!" On other occasions the Spaniards say, "Vaya con Dios!" ("Go with God!") In the Tyrol, people exchange the formula "Praised be Jesus Christ!" and the Neapolitans, that of "Increase in holiness!"

2. The forms of greeting that pray for the health and well-being of the friend addressed are distributed generally. Indeed, our term "salutation" is derived from the Latin *salus*, and similar etymologies are found in other languages. The Ottoman cries, "Be under the guard of God!" In Arabia, on the first meeting of the day, the proper phrase is, "May God strengthen your morning!" or "May your morning be good!" The Persian begins his polite address with "I make prayers for thy greatness." The return to a salutation in the Orient is sometimes not only religious, but non-committal. If an Arab is directly asked about his health, he responds, "Praise be to God!" leaving his condition to be inferred from the modulation of his voice. If the form of the query is, "Is it well with thee?" the answer is, "God bless and preserve thee!" The Zuffi exchange the prayer, "May the light of the gods rest with thee!"

3. The general wish for health and prosperity, of which the English "farewell" as distinguished from "good-by" is an example, is often only implied in the query showing interest as to their present possession. The Arabs reiterate the query "How are you?" for some minutes, and, when well brought up, afterwards interrupt the subject of the conversation by again interjecting "How are you?" many times. Our "How d'you do?" has almost lost significance, as it is seldom answered except by reproduction, no one supposing it to be a *bona-fide* request for information. Many other salutations, abroad as well as at home,—e.g., "Good-morning!" "Hot day!" "Cold day!" or other meteorologic comments,—are now mere watchwords or countersigns, to indicate that the parties meeting are on good terms. Indeed, the origin of many old forms is the distinct declaration of peace, which was practically useful in the turbulent days when an enemy was more frequently met than a friend. This "passing the time of day" is now common at the occasional meeting of good-natured persons, by which the inane words form the friendly recognition of one of the same race.

The North American Indians do not have many conventional forms of salutation. Their etiquette generally is to meet in silence, and smoke before speaking, the smoking being the real salutation. But a number of tribes—i.e., the Shoshoni, Caddo, and Arikara—use a word or sound very similar to "How!" but in proper literature "Hau!" or "Hao!" Most of the Sioux use the same sound in communication with the whites, from which the error has arisen that they have caught up and abbreviated the "How are you?" of the latter. But the word is ancient, used in councils, and means "good," or "satisfactory." It is a response as well as an address or salutation.

An interesting point in this connection is the objection of some peoples to being praised for flourishing health, which is never admitted. For instance: to the Cingalese the expression "You look well," or "You have become stout," is very annoying, the reason being that the notice of malign deities would be attracted to their fortunate condition, upon which it would be destroyed. This illustrates the old story of the jealous gods, and the power of evil being the most important deity, and recalls many classic fables, among others that of the ring of Polycrates, in several lands and languages.

That this dread survives among some of the peasantry of Europe appears in their invariable refusal to respond that they are perfectly well, and a similar superstition has recently been reported from the mountains of North Carolina. The Chinese, in greeting, not only depreciate their own status, but exaggerate that of the party of the other part. The established ritual averages thus: "How is the excellent health enjoyed by your wealthy

and accomplished highness, and that of the brilliant full moon his spouse, and of the strong lions his sons, and graceful gazelles his daughters?" The obligatory response would be, "The ignorant beggar whom your benevolence deigns to notice is in his usual condition of dirt and disease, and the sow his wife, and pigs his offspring, starve in their old filthy sty." Perhaps the elegant expressions of response by cultured persons in absolute health, "Quite well, thank you!" "Passably," "About the same," and the like, considered to be a polite avoidance of boasting, have their origin in high antiquity.

Persons of general intelligence in the most civilized nations yet show relics of the dread of demons when an epidemic prevails. It was lately noticeable in Washington that the response about freedom from the grippe generally contained some qualification,—“Haven't got it yet,” or the like.

The wish of salute is often specific, connected with the circumstances of environment. The people of Cairo anxiously ask, "How do you perspire?" a dry skin being the symptom of the dreaded fever. In hot Persia the friendly wish is expressed, "May God cool your age!" that is, give you comfort in declining years. In the same land originates the quaint form, "May your shadow never be less!" which does not apply, as often now used in Europe, especially in Ireland, to the size and plumpness of the body as indicating robust health, but to deprecate exposure to the noon sun, when all shadows are least.

The Genoese, in their time of prosperity, used the form "Health and gain!" In some of the Polynesian isles the prayer for coolness is carried into action, it being the highest politeness to fling a jar of water over a friend's head. According to Humboldt, the morning salute on the Orinoco is, "How have the mosquitoes used you?"

The old religious views of the Persians are found in their wishes, "Live forever!" and (still retained in Spain) "May you live a thousand years!" They believed only in this life, and that through divine favor it might be unlimited.

4. The terms of affection in greeting are too numerous to be now recited. The following are mentioned as unhackneyed and of interest. Some Orientals say, "Thou hast made me desolate by thine absence from me;" and the ordinary form of greeting among the Zulus is simply, "I see you, and I am glad."

The variant phrases of respect are also multitudinous. Perhaps the most distinct form in which the common and ancient expression of the East, "I am your slave," survives in western Europe is in the Piedmont district of Italy. The Spaniards, through the influence of Moors and Jews, have many relics of Orientalism. It becomes colloquial in the form *Usted* contracted from "Veustra merced;" "your mercy," "your grace," often appearing in the phrase "I kiss my hands to your grace."

But the forms of respect and subservience, more than those of affection, have become established into titles of honor and nobility, therefore can be presented with some defined system not boundless as are the epithets poured from the ardent imaginings of friends and lovers.

It is not, however, possible now to attack the grandiose division of human vanity to which Selden alone devoted one thousand printed folio pages. Perhaps the only civil title of ceremony, as distinct from official designation, legally existing in this country, is that of esquire, which has almost fallen into disuse, being chiefly employed by attorneys-at-law. But they have a right to it. An esquire was originally an attendant on a knight; but later in England the title was given to all officers of the crown, which included attorneys, who are officers of the courts. Hence the English jest of the last century, that attorneys were only "gentlemen by act of Parliament." Such acts, being in force in our colonial period, applied to attorneys here, also officers of court.

"Sir," which has ceased to be a title in becoming the general form of address, has been generally derived directly from "sieur," the abbreviation of "seigneur," implying the lordship of land so essential to the feudal system that the legal maxim ran, "Point de terre sans seigneur;" but the derivation of "sieur" and "sire" was from the same root, originally signifying "senior," i.e., "elder," with the synonyme of "father." The form "sire" ante-

ceded that of "sieur;" and undoubtedly the term of respect involving the concept of "elder" and "father" long preceded the ownership of land. Terms of rank and gradation founded on seniority and paternity are fundamental in the sociology of the North American Indians, prevailed among the founders of Rome, and, as terms of respectful address, are still common in Asia and eastern Europe. Therefore, when you address a man as "sir," you etymologically imply that he is your father.

The subject of titles in the United States presents some amusing features. The Constitution prohibits titles of nobility; and of course the people insist upon all other kinds of titles, thereby proving the accuracy of the Roman poet's oft-quoted lines about the futility of casting out nature with a pitch-fork. Not only does a day's possession of any office baptize the possessor with a title for the remainder of his life, but often official or professional titles are bestowed in taste or discretion; so that "colonel," "judge," and "doctor" only imply some peculiarity in form, manner, or clothing. In this multiplicity and plethora it is strange that some men confer titles upon themselves without authority, as it is far more dignified and distinguished not to bear or allow any. This is not on the principle, often too broadly asserted, that "the post of honor is the private station," but because all titles of honor and distinction are degraded by misuse; e.g., that of "professor," now the perquisite of balloonists and jugglers. But there can be no argument with a superstition. The best treatment of the folly would be that advocated to settle the liquor question,—by high license and strict inspection. Let every man take what title he may choose, but pay for the privilege. The result would be that either the craving would diminish or the revenue increase from the taxation of a useless luxury, either of which is a desideratum.

All relations to addresses, titles, and ceremonial vi-its involve the assertion of, contention for, and regulation of, precedence. These are of immemorial antiquity, being traceable to the principle of the struggle for existence and survival of the fittest, and have diminished with the decreased operation of that principle among men, not with the discontinuance of militancy. The extent of the surviving attention to precedence in England, as gathered from the mere literature on the subject, would be misleading. In the heraldic catalogues there are eighty-nine distinct sets of men above the rank of a burgess, who have their specified places in processions and even at ceremonious dinner-parties, but every-day life is little affected thereby; always, however, remembering Thackeray's dictum, that an "Englishman does love a lord." As regards ceremonies at dinner-parties, the compliment of being served first has its disadvantages. Unless the guest thus distinguished exhibits greediness, the food placed before him will become either too cold or too warm before the others of the company can be ready. This is another case where the mean is golden.

The most illustrative notes on precedence appear in diplomatic history. Once at the court of France the envoys of Genoa and Brandenburg, being unable to agree as to which should present himself first to the king, stipulated that whichever first reached the palace on the day appointed should have the precedence. The prudent Prussian sought to make himself safe by sitting down on a bench in the hall of the palace all the night before; but the treacherous Italian, arriving near the proper hour, and seeing his adversary half asleep on the bench, slipped by into the royal bedroom. Precedence must be maintained for mere dignity, without any direct object: so two ambassadors who met face to face on the bridge at Prague were obliged to stop there for the entire day because neither of them would disgrace his country by letting the other pass.

In cases of milder action it was usual to stipulate, by previous arrangement, for absolute and exact equality in every detail. This was the plan pursued when Mazarin and Don Louis de Haro met to settle the conditions of the marriage between Louis XIV and Maria Theresa. The two ministers stepped together, with the right foot, side by side, into a council-chamber hung in corresponding halves with their respective colors, and sat down at the same instant precisely opposite each other at a critically square table on two mathematically equivalent arm-chairs.

The last connected chapter of Macaulay's "History" shows amusingly the waste of time and energy in which Kaunitz and Harlay watched one another's legs at the Congress of Ryswick, lest a priority in muscular action should jeopardize, as it did delay, the peace of two continents. One of the most stupidly arrogant assertions of precedence was made by Napoleon in 1808. The Almanach de Gotha had just been printed for that year with the regular alphabetical arrangement of the reigning houses, beginning with the Anhalt duchies; but the parvenu emperor suppressed the edition, and required the whole to be printed with his name in the first page.

"Giving" or "taking the wall" in passing, so frequently alluded to in Shakspeare and other authors of his time as an indication of rank, had tangible loss or advantage; as in the narrow and crowded street, destitute of sidewalks, proximity to the wall was safer and more convenient. But the same precedence on entering or leaving a room or passing through a doorway was contended for in vanity and pretension. A happy example of the modern politeness in which, both in form and fact, egotism has yielded to altruism, is in the rivalry, now so frequently shown, when two men accidentally meet at a door or other passage, by which each presses the other to advance, thus showing a survival in reverse of the old contention for precedence.

Upon a general summary of the whole subject of salutation, it is obvious that it was once a serious tax upon time. Both in the Old and New Testament injunction was given, whenever expedition was required, "to salute no man by the way." The minute, tedious, and verbose politeness of the East was an insuperable impediment to rapid travel; and this is still the case among such people as the Araucanians, whose formalities of meeting and greeting occupy at least a quarter of an hour.

The greatest abbreviation of such forms appears among the most cultured of modern peoples, and is directly in the evolutionary line of utility through saving of time; but it has still further significance. The forms of ancient peoples and of existing savages and barbarians show intention to accomplish something definite by the special act of salutation. They are generally limited to classes and individuals, are sometimes with petition for or in declaration of peace, are made in personal placation, or are the exchange of supplications to whatever deities or demons may be credited with power. Cultured people do not now regard these objects to be appropriately connected with salutations of courtesy. They now use a brief, nearly meaningless formula almost indiscriminately, so that it has no special relation to the persons saluting and saluted or to their respective status. It is the recognition by one human being of another, and is the best mark of real culture, its absence characterizing the savage or the boor. Its spirit is found in Talfourd's lines:—

"It is a little thing to speak a phrase
Of common comfort, which by daily use
Has almost lost its sense; yet . . . 'twill fall
Like choicest music . . .
To him who else were lonely, that another
Of the great family is near and feels."

But it is not a little thing that a simple, kind recognition from man to man, even if often perfunctory, should replace the terms of elaborate egoism and stupid superstition. It is a sign of the evolution in which

"Love took up the harp of Life, and . . .
Smote the chord of Self, that, trembling, passed in music
out of sight."

NOTES AND NEWS.

In January of the present year two samples of compressed or tablet tea were presented to the Museum of the Royal Gardens, Kew, by Col. Alexander Moncrieff. In the new number of the *Kew Bulletin* the letter with which these samples were accompanied is printed, and much interesting information as to the making of compressed tea is brought together. Repeated attempts have been made to introduce compressed tea into this country, but never with complete success. "A few years ago," says the

Kew Bulletin, "two companies were formed for working it; and at the present time there is a company in London which deals exclusively in this article, a sample of which is in the Kew Museums. It is claimed for this tea that it has many advantages over loose tea, the chief of which is, that, the leaves being submitted to heavy hydraulic pressure, all the cells are broken, and the constituents of the leaf more easily extracted by the boiling water, thus effecting a considerable saving in the quantity required for use. Its great advantages over loose tea, however, would seem to be its more portable character; and in the case of long sea-voyages, or for use in expeditions, the reduction of its bulk to one-third. The compression of tea into blocks, further, it is said, constitutes a real and important improvement in the treatment of tea. These blocks weigh a quarter of a pound each, and are subdivided into ounces, half-ounces, and quarter-ounces. This insures exactitude in measuring, and saves the trouble, waste, and uncertainty of measuring by spoonfuls. It also insures uniformity in the strength of the infusion. By compression it is claimed that the aromatic properties of the leaf are retained for a much longer period, and that it is better preserved from damp and climatic changes."

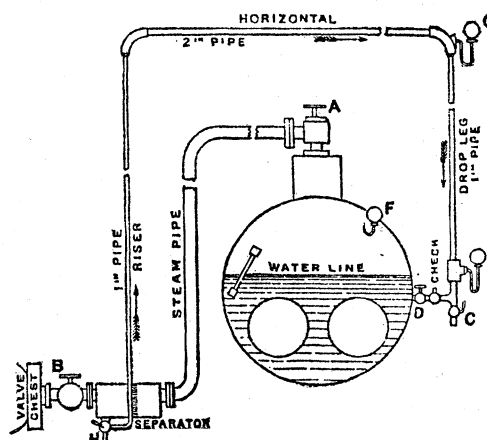
—In accordance with an agreement between the American Society of Mechanical Engineers and the American Institute of Electrical Engineers, the headquarters of the Institute of Electrical Engineers will hereafter be at the house of the Mechanical Engineers, 12 West 31st Street, near Fifth Avenue. Communications and exchanges should be addressed accordingly.

—A paper on the Mannesmann weldless tubes was lately read before the Society of Arts, London, by Mr. J. G. Gordon, the chair being occupied by Sir Frederick Bramwell, who referred to the importance and interest of the subject, and to the extraordinary means by which the desired result was attained. The process, according to *Nature*, consists in the solution of a purely kinematical problem; viz., the arranging of the velocity ratio of a pair of aconoidal rolls so as to change a solid piece delivered to them at one end into a hollow tube passed out at the other. These rolls revolve at about 200 to 300 revolutions per minute, and, by their action on the hot and therefore plastic steel, stretch it, and make a hollow in the centre. The substance of the metal must be sufficiently homogeneous and plastic; and in passing through the rolls it undergoes a violent twisting and stretching action. The bar, in fact, in its passage through the rolls, is twisted as a thread is twisted in a spinning-machine, the material being drawn from the interior. This action was illustrated by one of the exhibits, which consisted of a bar, the ends of which were slightly drawn down under the hammer, so that the rolls could not act on them. A hollow was thus produced in the solid bar of metal, the contents of which were tested by Professor Finke of Berlin, and found to contain 99 per cent of hydrogen of its total volume. The remaining 1 per cent he considered to be probably nitrogen. In the carrying-out of the process, 2,000 to 10,000 horse-power is required for from 30 to 45 seconds, according to the dimensions of the tube. Although this is all the time actually required to convert a bar 10 to 12 feet long and 4 inches in diameter into a tube, a certain amount of time is required to adjust the guides, to deliver the bar to the rolls, and to remove the finished tube. The time so spent is employed to accumulate energy in a fly-wheel 20 feet in diameter, weighing 70 tons, and revolving 240 times in a minute, the periphery of which, therefore, revolves at 2.85 miles per minute. By this means a steam-engine of 1,200 horse-power is quite sufficient to do the work. A peculiar feature of these rolls is that the resulting tube is a test of the material and process. If the metal is homogeneous throughout, and well melted, well rolled, and carefully heated, it makes a perfect tube; but if there is a flaw in the metal, or if it has not been properly heated, the rolls cannot make a tube out of it. The paper, which was illustrated by photographs of the mills and engines, led to a very interesting discussion, in which Sir Frederick Bramwell, Professor A. B. W. Kennedy, Mr. Alexander Siemens, and others, took part.

—In France much interest is being taken in the question whether a university shall be established in Paris. At a meeting of the general council of the Paris faculties, held June 14 at the

Sarbonne, it was agreed that a university with five faculties (Protestant theology, law, medicine, science, and literature), and an upper school of pharmacy, should be formed. "The principal effects of the constitution of the university," says the Paris correspondent of the *London Times*, "will be to permit the faculties to make arrangements for the organization of instruction (under the form of schools or institutes), of which the elements are at present scattered in several faculties, and to facilitate a sort of general instruction of a philosophical character, to which the professors of all the faculties will contribute, and which will be addressed to the students. The university will grant, besides professional degrees, diplomas of purely scientific studies to native and foreign students."

—The steam-loop is an appliance for returning to a steam-boiler the condensed water from steam-pipes, jackets, heating-coils, and the like. It is a striking piece of apparatus, since it will return water to a boiler situated at a higher level, without the intervention of pumps, injectors, or other motors. The water, according to *Engineering*, simply flows back just as if it were under the action of gravity, the only means of communication being a range of pipes. The action will be readily understood by reference to the annexed diagram, which shows a steam-boiler connected by a steam-pipe from the dome *A* to a steam-engine *B*. Immediately in front of the engine is fixed a separator, which catches the water carried over by the steam, as well as that which condenses in the pipe. From the bottom of the separator there rises a pipe until



it attains a considerable elevation above the water-line of the boiler; it then proceeds horizontally, and finally descends, and enters the boiler at *D*. The water from the separator follows the course of the pipe, and flows into the boiler at a higher level than the separator. The reason of this will be readily seen. The steam-pipe and the steam-loop are both connected to the boiler; but of course there is a slight difference of pressure in them, the pressure falling a little the farther the steam gets from the boiler. Let us suppose the pipes to be blown through at the cocks *H* and *C*, and these cocks then closed. Water will commence to collect in the separator, and the pressure in the loop to fall by reason of condensation. The excess of pressure in the separator will immediately begin to drive the water up the riser, not in a solid body, but in separate plugs or plungers, which will follow each other at frequent intervals. As soon as these reach the top of the riser, they will flow along the horizontal pipe, which is of large diameter, and collect in the down pipe. Here the mass will remain until the head of water, plus the steam-pressure above it, is sufficient to raise the check-valve, when a part of the column will flow into the boiler. Usually a head of a few feet is sufficient to effect this; but, if the pipes be very long, it may require twenty feet or more. At the moment when the check-valve lifts, the gauges at *E* and *F* will give the same reading, while the gauge at *G* will show the steam-pressure existing at that point. The water is thus returned to the boiler without loss of pressure, and almost without loss of heat. This is done continuously and automatically, the only care required being to blow through occasionally to remove the air.

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Communications will be welcomed from any quarter. Abstracts of scientific papers are solicited, and twenty copies of the issue containing such will be mailed the author on request in advance. Rejected manuscripts will be returned to the authors only when the requisite amount of postage accompanies the manuscript. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a guaranty of good faith. We do not hold ourselves responsible for any view or opinions expressed in the communications of our correspondents.

Attention is called to the "Wants" column. All are invited to use it in soliciting information or seeking new positions. The name and address of applicants should be given in full, so that answers will go direct to them. The "Exchange" column is likewise open.

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GEORGE HAMMELL COOK.¹

"YET once more, O ye laurels, and once more
Ye myrtles brown, with ivy never sere,
I come to pluck your berries harsh and crude,
And with forced fingers rude
Shatter your leaves before the mellowing year.
Bitter constraint and sad occasion dear
Compel me to disturb your season due."

ONE by one the great men depart. As they pass from the sphere of personal association through the portal of the grave into the world of immortal influence, their deeds and honors are recounted by those who remain.

When the last entry has been made, the book is opened, the account is rendered. Blessed is he whose good deeds more than balance his emoluments, whose services to mankind more than equal the honors paid him by mankind, for "it is more blessed to give than to receive." Thrice blessed is the man whose life and services we commemorate to-day.

The generation now at the zenith of life succeeds a generation whose zenith was clouded by war. As the great men of that day pass out through the sunset of life, their battle-deeds are told. It is thus that the mortuary ceremonies of this generation echo the clangor of charging squadrons, the shrieking rattle of battle-lines, and the roar of batteries.

Sequestered from the pomp of parade, from the roar of funeral gun, from the battle cemetery that hides under marble columns

¹ Address of Major J. W. Powell at the funeral of Dr. G. H. Cook, late State Geologist of New Jersey.

the victims of battle strife, here in the peaceful halls of learning we assemble to commemorate the life of a man whose ways were "paths of peace," whose chariot of progress through the world bore no scythe of destruction, whose life was wholly beneficent, whose youth was devoted to learning, whose early manhood was devoted to instruction, whose prime of life was devoted to research, and whose old age was devoted to the organization and development of institutions for the increase and diffusion of knowledge.

It falls not to my task to characterize the student life of George Hammell Cook. That his opportunities for training were wisely used is abundantly demonstrated by the monument of success which he unconsciously reared for himself in the years of his public activity. It is not in my province to speak of his professorial life. The scholars and public men who were guided into a higher intellectual life constitute a living monument to his fidelity and genius as an instructor.

It was as a man engaged in research that I first knew Professor Cook, and learned to honor his untiring industry, his deep insight, and his intellectual integrity. The catalogue of his contributions to science is long—too long to be recounted here, for it constitutes the annals of a long life. Only a few examples can be used to illustrate the wealth of his accomplishments,—in chemistry, geology, and geography.

In 1854 Dr. Cook became an assistant on the Geological Survey of New Jersey. This was his induction into scientific work. For three years the field of his research was in the southern part of the State, in the marl-beds and amid the potter's clay. Up to that time little attention had been given to these sources of wealth, and fields of industrial operations.

While in this field of labor, he discovered that a thorough geological survey must be based upon geography, and he constructed a topographic map expressly for the representation of geologic structure. His stratigraphic determinations were based largely upon instrumental measurements and carefully drawn plans and profiles of the land surveys. Thus was inaugurated in America a system of geological surveying which has gradually obtained ground until it is practically universal. The anatomy of the earth is exhibited in its topographic forms. Plains, valleys, terraces, hills, and mountains are full of meaning to the geologist, for in them is revealed the deep-seated structure of the earth and the history of that struggle between the great geologic powers which is forever in progress, and from the throes of which the continents are born.

The theatre of these early operations was near the coast, where the tides of the Atlantic ceaselessly surge to devour the land. Here his trained eye observed phenomena that led to a long system of observation and investigation, by which he ultimately demonstrated that the margin of the coastal plain of the Jersey shore is slowly subsiding, and that the sea is steadily enlarging its dominion. This work, as it has progressed through the years ending in his death, constitutes an important contribution to the facts and philosophy of the science of geology which he cultivated.

In 1864 Dr. Cook was appointed State geologist, and held the position until his death. His first task was found in preparing an elaborate exposition of the mineral resources of the State, which had been brought to light by earlier surveys; and he added to these a series of special investigations, such as were required for the symmetric treatment of the subject. This exposition was completed and published in 1868 in a large octavo volume accompanied by a portfolio of maps. He thus at the beginning cleared the field, systematized the existing knowledge, and developed a comprehensive plan for the researches which he carried on until the day of his death. To him geology was not wholly a speculative science. His conception of the duties imposed on him by being intrusted with public funds urged him to administer his trust in such a manner that the welfare of the State might be increased thereby. He did not neglect the great philosophic problems of his science, for he directed the investigations of the survey into structural geology, paleontology, chemistry, and geography; but he held over these researches a constant corrective by making them responsible for exact determinations of industrial

value. A series of great economic problems was forever in his mind: How can these inundated lands be regained? How can the broad fields of New Jersey be fertilized? How can the potter's art be developed from the clays of the coastal plain? How can the deposits of zinc be utilized by the industries of the State, and how can the great beds of iron-ore be transformed into the instruments of modern civilization? And he applied the principles of science to these problems. Geography, geology, paleontology, and chemistry were all made subsidiary to the leading purpose of his survey.

Science was thus made to bless mankind, and the advancement of science did not lose thereby; science and industry in copartnership were each strengthened; industries of great magnitude and value to the people were steadily developed; and science itself steadily grew under the genius of his guidance.

The State of New Jersey is the seat of ancient seas. From the sediments therein deposited the rocks of the hills of New Jersey were made. The history of New Jersey through long geologic time is a history of innumerable earthquakes consequent upon the upheaval and depression of its lands. At one period in its history it was the scene of vast volcanic activity, when molten rocks poured to the surface. Built by the sea, it has been fashioned by the storm, and the waves of ocean have carved its shores with a fretwork of beautiful forms. Its low shores, its coastal plains, its broad valleys, and its billowy hills have been carved by rains and rivers until it presents a landscape of beauty. These physical features of the State, which express its beauty, and record its history, and reveal its structure, became one of the great studies of Dr. Cook when he began the topographic survey of the State. He lived to see that survey completed; and he gave to the industries of the land and to the science of the world the first great topographic map of a State constructed on this continent. Had this been his sole contribution to the knowledge of the world, it would have made him worthy of high honor.

With the increase of population in this country the ordinary wells which gather the water from the surface steadily become polluted, and dangerous to health and life. With the multiplication of manufacturing establishments, and through other agencies ever on the increase, the streams become polluted, and their waters are freighted with disease. The supply of pure water for domestic purposes to the people of the State of New Jersey early attracted the attention of Dr. Cook. With profound insight into the physical structure of the State, he early became convinced that the hills of the highlands constituted a catchment area for the waters of deep-seated rocks in the lowlands; and that, through these pervious formations outcropping above, the waters were filtered and purified, and could be reached by artesian boring along the coast. His prophecy was fulfilled, and now the beautiful towns of the region are made salubrious through the genius of his scientific induction. To-day thousands of wells extending along our coast from New York to Florida pour out the pure waters of life, and bless multitudes of people, and make their homes happy. The clouds of the highlands are tributary to the cottages of the coast, and the rocks deeply seated in the foundations of the earth carry them on their way.

Through long years of his life Dr. Cook was engaged in investigations relating to agricultural industries. The interests affected by these investigations are vast, for they are at the foundation of all prosperity. The facts and principles to be investigated are multifarious and complex, relating to climate, to soil, to vegetal life and animal life, and the relations of all these to human life. Science has done much for modern industries in manufacturing, in mining, in transporting, and in commerce; the hidden powers of the world have been discovered and tamed; but science has done comparatively little for agriculture; and Dr. Cook was one of the founders of a vast system of research, which has now been established throughout the land on a comprehensive and symmetric plan. Through the agency of these founders, of whom Dr. Cook was one of the leaders, experiment stations have been established in every State of the Union, endowed by National and State grants, and the greatest army of investigators ever organized under the sun is now at work on the complex problems of agricultural science. This was the crowning labor of a long and

fruitful life. It has been a quiet but vigorous and efficient movement, and the people do not realize what has been done. The labors in this cause, of this beneficent friend of mankind, were untiring. They were conducted among men of affairs, in the seats of learning, in State legislatures, and in the National Congress. Everywhere his benign influence was exerted and felt, his counsels were taken with delight, and he became a leader of men where only the wisest and best men could be led. His appeal was to scholars and statesmen, and the counsels of the old man eloquent ultimately prevailed.

From the early history of civilization until the present time, many great thinkers of the world have been constructing temples of philosophy. It began with Socrates, Plato, and Aristotle, and this temple-building has continued through the times of St. Thomas Aquinas down to Hegel, Schelling, and Fichte, and even later to the days of Herbert Spencer. These theorizing philosophers have attempted to construct systems for the explanation of all things of the universe, and to build their philosophy upon a few "fundamental principles,"—postulates, presuppositions,—to construct temples founded on their domes. One by one these great philosophies have crumbled into dust, and we know them only by their ruins. The history of civilization is marked by the ruins of fallen philosophies, now most interesting to historical archaeology.

In modern times another philosophy is being constructed,—the great temple of science. On this structure a vast army of scholars are at work through the multifarious methods of scientific research, and they are building this temple with its foundation on the granite base of fact. George Hammell Cook was a master workman on this temple, built as it is being built out of the facts and principles discovered by modern scientific research.

I knew Dr. Cook best as a counsellor and a friend. Having responsibilities thrown upon me kindred to those borne by him, I was glad to seek wisdom at his feet. Honest and pure, he was wise and far-seeing, and for his counsel I owe a debt of gratitude. His ways were characterized by directness and simplicity, and I learned to love him as a father, and be guided by him as a son. And now the wise old man is gone. This fountain of wisdom flows no more. The processes of time and change never cease. On we go with the stream of events. Shall our lives also make the world better?

The light is from on high.

The powers of the earth come from the heavens.

They who have wielded these powers best are placed in the firmament of history.

The method of human progress is not through "the survival of the fittest," for man is more than the brute.

The agency for the progress of mankind is the influence of the fittest. In all ages this has been recognized, now clearly, now dimly. In harmony with its principles, those who have best served humanity have been placed on high among the stars of history, that the light of their immortal deeds may forever shine upon the pathway of mortal men.

George Hammell Cook is among the stars. On earth he loved justice and he rendered justice; he loved the truth and he sought the truth; and, dead, he lives again, the star of justice and truth. O venerable friend! your counsels were wise, and your example was beneficent. Shine on to illumine our way to the truth and the right with the light of the knowledge of the glory of God.

LETTERS TO THE EDITOR.

**** Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

The editor will be glad to publish any queries consonant with the character of the journal.

On request, twenty copies of the number containing his communication will be furnished free to any correspondent.

The International Congress of Geologists.

I HAVE just seen a note of Professor Lesley's in your issue of June 13, in which he characterizes the statement of the May *Naturalist* regarding the action of the committee on organization

of the International Geological Congress as erroneous. In the June number of the *American Geologist*, p. 386, will be found an accurate print of the official type-written notes of that meeting by the secretary, Professor H. S. Williams, signed by him, and sent to me with the request for my vote on the question of appealing to the bureau to change the place of meeting. This official statement establishes, first, that of those present, Powell, Dutton, Gilbert, Hague, Marsh, Walcott, and Williams were officers of the United States Geological Survey, and Cope, Hall, Lesley, Stevenson, Whitfield, Winchell, and Frazer were not. The above comprised all who were present. Of those who were not members of the United States Geological Survey, Lesley, Stevenson, Whitfield, and Winchell voted for the submission of the question to the bureau.

Capt. Dutton of the United States Geological Survey did not vote. If the vote was as stated, 9 to 3, who constituted the nine? Professor Lesley rightly says Hall, Cope, and Frazer voted "no."

So much for the vote being carried by the members of the United States Geological Survey.

Major Powell moved that "it is the opinion of the committee that the place should be changed" (see the secretary's official notes). I was also present at the meeting, and can testify to the accuracy of the secretary's notes. Major Powell did *not* oppose the selection of Washington, but remained silent while it was voted.

Only after the meeting was it given out that Major Powell did not wish the congress to come to Washington. He certainly did *not* urge "that nothing be done by the committee to cause such an action abroad" (i.e., the change).

Both Major Powell and the writer of the above note emulated Shakspeare's Julius Cæsar in putting off the crown, but, like that hero, ended by accepting it.

PERSIFOR FRAZER.

Sea Girt, N.J., June 30.

BOOK-REVIEWS.

A Handbook of Descriptive and Practical Astronomy. II. Instruments and Practical Astronomy. By GEORGE F. CHAMBERS. 4th ed. New York, Macmillan, 1890. 8°. \$5.25.

PROBABLY at no time have there been so many amateur astronomers with good telescopes as at present, and for all these would-be astronomers this book on astronomical instruments and their use will have an interest.

Chambers's "Astronomy" calls for no introduction to public attention at our hands, as the fact that this is a fourth edition testifies; but it may be well to repeat, what we announced when noticing the first volume of this new edition some weeks since, that the revision this time will result in the production of several distinct volumes, each treating of some special phases of astronomical science. It is thus that the present volume is limited to instruments, their employment in observations, and the proper mounting and housing of them.

Every one who knows the possessor of a good telescope knows how desirous this possibly happy personage is to have his instrument where it can be used. To meet this very want, our author has introduced a number of plans for small observatories, suggested not only by his own experience, but also by that of several of his professional friends. We feel sure that these will be eagerly sought by the amateur astronomers of this country, as well as by those of Great Britain, for whom they are specially intended.

But it must not be supposed that America has been neglected, for good descriptions are given of some of our newest and best observatories.

One chapter is devoted to a history of the telescope, which gives a completeness to the work, and is likely to furnish answers to the queries of many a questioning visitor.

The use of the spectroscope in astronomical work, which has led to so many important results, and which has so much fascination for those who have not the time to follow up the older astronomy, is cared for in several chapters.

We commend this book, and trust its use may help a few on this side of the water to a more intelligent use of their time and

their opportunities, so far as they have available instruments, in developing some really important investigation in astronomical physics. The play of seeing more clearly than with the naked eye the features of the "man in the moon" soon ceases to give pleasure, and bears no proportion to the real delight of securing some small addition to the world's stock of knowledge, which can be had as the result of some intelligent work. Let those who wish for this delight secure a copy of the book here noticed, that they may know more of what is within their reach.

The True Grasses. By EDUARD HACKEL. Tr. by F. Lamson-Scribner and E. A. Southworth. New York, Holt. 8°. \$1.50.

THIS is a good translation of Professor Hackel's valuable contribution to *Die natürlichen Pflanzenfamilien*, that great German publication on the natural families of plants edited by Dr. Engler and Dr. Prantl. As Professor Hackel stands among the foremost agrostologists, his work, expressing as it does the latest and most authoritative views upon the subject, is especially valuable; and, as it contains so much that is of practical importance, we are glad to see it made available to English readers.

The work embraces the grass family as a whole, and enumerates the best-known economic species and their uses. It discusses the structure and morphology of the grasses and their arrangement into tribes and genera, and points out their characters in a manner that will enable one to classify readily any grass that may come into his hand. For the benefit of persons unfamiliar with botanical keys, an illustration of the manner of using the keys of analysis is given in a brief introductory chapter; and a full glossary and index are appended, adding much to the usefulness and value of the work, especially for private students and general readers. The illustrations, of which there are upwards of a hundred, are mainly reproductions from the originals in the German work, though a few were drawn especially for this translation.

The Elements of Machine Design. 11th ed. By W. CAWTHORNE UNWIN. New York and London, Longmans, Green, & Co. 16°. \$2.

THIS admirable and unique treatise on the elements of the work of the mechanical engineer designing machinery has now been in use in schools and offices on both sides the Atlantic for some years, and has been repeatedly revised and continually extended, until, from a little volume of perhaps three hundred pages, it has grown to two volumes of larger extent; and a third part is more than half promised by its distinguished author. It is attempted by its writer to give a fairly complete account of the methods of proportioning parts of machinery, and especially of that representative machine the steam engine, such as are in use in the best practice of the most successful builders, and such as are at the same time sanctioned by the best scientific authority. The work is in some respects, in English, a counterpart of that of Reuleaux in the German; but it is more directly adapted to the needs of the practitioner, and the custom and practice of the shops. It is a success, as is well indicated by the extent to which it has been adopted as a handbook and as a text-book, and by its rapid sale.

It gives a concise account of the materials used by the engineer; describes the various straining actions met with in machines; exhibits the results of research and experience as to straining action in structures and elements of machines; summarizes the results of latest experiments upon the strength of the several kinds of riveted joints, as used in boiler-work; determines the proportions of bolts, keys, and other connecting pieces, of journals and pins, and shafts and gearing. The principles of friction are applied in the determination of the proper proportions of bearings, and to the measurement of the efficiencies of machinery; while belting and rope transmission are given extended study. The second volume will deal with the details of parts of engines and machinery, and is promised for some time during the coming season. The third part will be devoted to the design of complete machines.

The book is brought up to date in a very satisfactory manner. The chapter on riveting is given large extent, and includes the results of the experiments of its author on riveting, as reported to the Institution of Mechanical Engineers. That on friction is the

only one in the modern technical literature of machine design, of this character, so far as we know, which includes the now well-known facts relating to the modification of the laws of solid friction by the introduction of the lubricant. The experiments of Hirn, who first discovered this modification, are alluded to, and those of Tower are given considerable attention; but, curiously enough, those of Thurston and of Woodbury in this country, which have been vastly more extensive, and which relate much more closely to the conditions of familiar ordinary practice, are not even mentioned, though they are now the basis of all rational work in the proportioning of journals, under other conditions than those of the Morin experiments, or of the comparatively rare "oil-bath" lubrication.

Elementary Dynamics of Particles and Solids. By W. M. HICKS. London and New York, Macmillan. 12°. \$1.60.

THIS closely printed text-book, in the neat standard style of the Macmillans' publications of the class, is a well-written treatise on the elements of mechanics for schools and colleges. It is substantially of the same grade, and of similar extent, with those familiar to teachers as usually adopted in the English institutions of learning. In such a case there is little opportunity for originality, and the subject admits of but little safe or profitable variation from the almost universal and standard methods of treatment. As stated by its author, the chief points of novelty are the consideration of the division of statics as a special case of kinetics, and the methods of discussion of the ideas of mass and of momentum, which are considered before taking up the ideas of force and resistance. This the author thinks the best, if not the only logical, order of procedure; and especially so, as the whole must be subject to confirmation and proof experimentally. He would establish his work on this basis, rather than upon the usual system of assumption, from experience, of general laws, and a logical construction of the science by building upon those laws. The work is well done, and, for those who prefer this method of treatment, it will be found an excellent text-book. The order of treatment is, (1) rectilinear motion of a particle, (2) forces in one plane, (3) motion of rigid bodies. An unusually rich collection of problems and examples is given.

The second part includes the study of machines and the modification of their efficiency by friction; the book being intended, as the author says, to meet the wants of mechanical engineers, as well as the classes of schools and colleges. It will hardly meet the needs of that class, however, as it is far too elementary and incomplete, as a system of applied mechanics, for their purposes. The treatment of the machines is the ancient one of studying the "six" (?) elementary machines, considering the inclined plane and the screw as different in principle, and the lever and the wheel and axle as different elementary machines. They are well treated. In the chapter on friction we have an example of the curious persistence of ancient and obsolete notions among the writers of text-books, who seem rarely to keep themselves abreast of the progress of research. The old notions of Coulomb are here made the basis of the study of friction losses of energy; and the author of the book seems entirely unaware that they have been obsolete, as respects lubricated surfaces, since the days of Hirn's investigations a generation ago. The young engineers of to-day might give such writers useful hints. The table of co-efficients of friction (six constants) is from the now almost forgotten work of Morin. They are, of course, correct for the conditions under which they were obtained, but not for other and the various usual conditions of machine operation; and no clue is given to the limitations of their application. The distinctions between friction of solids, friction of fluids, and "mediate" friction, are not alluded to.

Gems and Precious Stones of North America. By GEORGE F. KUNZ. New York, The Scientific Publishing Company. 4°. \$10.

THE author of this book is connected with the world-renowned firm of Tiffany & Co., and in his employment by this house as a gem expert has had a rare opportunity to become acquainted with the matters of which he treats in the book before us. Further, this expert knowledge has led to the employment of Mr. Kunz by

the United States Geological Survey on special investigations, which have made him the more conversant with his subject.

It may be asked, Are any gems found in North America? This question evidently presented itself to our author, as he opens his somewhat large treatise with the statement that gems are found here in great variety, but that there has been little systematic exploration for them, as the indications are not such as to justify the employment of large capital in the search. In fact, a week's yield of the granite-quarries exceeds in value the yearly output of gems the country over; and a day's yield of the South African diamond-mines is of more value than the year's yield of all gems in North America.

It is not to be supposed, however, that there is no search going on in this country for gems, or that cases are unknown in which persons for a while believe themselves the possessors of stones of great value found in their corn-field or sheep-pasture. Reports of such finds are constantly coming in, and many of them reach the jewelry house of Tiffany & Co. The stories of these deceptive stones, as told by Mr. Kunz, are interesting, and show that a book of the kind he has now brought out, if available in the libraries of the country, might quickly explain to the possessor of a green stone the differences between colored quartz and emerald.

Nine chapters are devoted to the gems of North America, in which descriptions are given of the gems, and chemical analyses to show their composition. A chapter follows on pearls, in which due attention is paid to the method of their formation. There are then two chapters on the precious stones of Canada and of Mexico and Central America. The book closes with two chapters devoted to aboriginal lapidary work in North America, and to the commercial value and uses of gems.

Aside from the gems found in this country, there is, as wealth accumulates here, a constant increase in the number of interesting gems held here by collectors, and of these Mr. Kunz has something to say.

The undoubted standing of Mr. Kunz as an authority on gems makes this work a real accession to the number of books to which one may turn for information; and, though the annual commercial output of gems is small in North America, we feel sure, especially as so many cognate subjects are treated within the book's covers, that there will be many—collectors and artisans—who will find it a help.

The execution of the book is to be praised in most respects,—the beauty of the colored plates, which are numerous and add much to its usefulness, is especially noticeable, and the general typographical appearance is excellent,—but there was evidently something wrong with the proof-reading, which left a long list of errors to be corrected in the unsatisfactory way of a list of errata.

AMONG THE PUBLISHERS.

THOSE who are interested in the uses, tests for purity, and preparation of chemical re-agents employed in chemical, microscopic, or petrographic analysis will find much valuable information in "Chemical Re-agents," by Charles O. Curtman, M.D., recently published by the John L. Boland Book and Stationery Company, St. Louis.

—Messrs. Longmans, Green, & Co. have issued a "Junior School Algebra." The author is William S. Beard, assistant master in Christ's Hospital. The book is intended for use in preparatory schools.

—"School Hygiene," by W. J. Abel, recently issued by Longmans, Green, & Co., contains simple directions respecting ventilation, eyesight, infectious diseases, and first aid in injuries. There is no attempt to explain the why and wherefore of the courses of procedure recommended. The manual is intended, as its title suggests, for use in schools, and it aims to describe what to do and how to do it, in case of diseases, accidents, etc.

—The leading articles in *Babyhood* for July are, "Fruit for Children," by J. W. Byers, M.D.; "Weaning," by D. Warman, M.D.; "The Kindergarten on the Farm" (continued series), by Adele Oberndorf; and "The Baby's Mind," by Elizabeth S. Brown,

M.D. The medical editor announces that hereafter more space will be given to questions of diet, in the department of "Nursery Problems," this subject seeming to be of never-ending interest and importance to the magazine's readers:

—The United States Department of Agriculture has issued Parts I., II., and III. of a "Bibliography of the More Important Contributions to American Economic Entomology." As far as published, this bibliography consists of an octavo volume of 454 pages, devoted to the writings of Benjamin Dann Walsh and Charles Valentine Riley. The importance of these writings can be appreciated when one considers that this index to them must have cost the government several thousand dollars. Samuel Henshaw is the editor of the work.

—A copy of the seventh edition of Bloxam's "Chemistry, Inorganic and Organic," was recently received. Among the new matter introduced is an account of Raoult's method for the determination of molecular formulæ, and Fischer and Tafel's investigations on the synthesis of sugars. The chemistry of vegetation has also been rewritten to suit more modern views. The portions relating to explosives, to which the book to some extent owes its reputation, have been duly revised. The publishers in this country are P. Blakiston, Son, & Co., Philadelphia.

—In the "Proceedings of the Royal Geographical Society for March, 1889," was published a paper on "The Selkirk Mountains," by W. S. Green. This paper was accompanied by a map giving the results of Mr. Green's surveys in this little-known region. As the space available in the "Proceedings" was naturally limited, it seemed desirable that a more extended report of the trip should be published; and this we have in "Among the Selkirk Glaciers," a recent publication of Macmillan. The author first had his attention drawn to the Selkirks by the reports of two friends who attended the meeting of the British Association in Montreal in 1884, and later took part in the excursion west on the then uncompleted Canadian Pacific Railway. It was not till the summer of 1888, however, that Mr. Green, accompanied by a friend well tried as a travelling companion, made his expedition. One

might suppose that a country reached by railway would offer little to explorers; but the difficulties presented by the Selkirks have debarred many travellers from venturing among them, so that we have in this book a valuable contribution to knowledge, as well as a well-written book of travel.

— "The Advancement of Science," by E. Ray Lankester, recently published by Macmillan, is a collection of essays printed in the various English reviews during the last ten or twelve years. The object of some of them was to help on government aid to science, and in general they were written with the purpose of informing the public of scientific progress. Naturally some statements of fact and theory are now a little out of date, but as a record of progress they have their value. The various titles are "Degeneration: a Chapter in Darwinism;" "Biology and the State;" "Pasteur and Hydrophobia;" "Examinations;" "The Scientific Results of the International Fisheries Exhibition, London, 1883;" "Centenarianism;" "Parthenogenesis;" "A Theory of Heredity;" and "The History and Scope of Zoölogy."

—Among the contributions in the forthcoming numbers of the English reviews for July, issued in this country in the original English form by the Leonard Scott Publication Company, New York, will be a paper recounting the particulars of a journey to Lhasa, the capital of Thibet, made by the Indian Buddhist scholar Sarat Chandra Das. This narrative, which deals with an almost unknown part of the world, has long been suppressed, in view of the information it gives to possible British rivals in Asia. Mr. Edward Bellamy will also have a paper in this number. The *Fortnightly Review* will contain, in addition to the usual variety of articles, one by Madame James Darmesteter, on "The Bookmen of Paris in the Fourteenth Century."

—The *Magazine of American History* opens its twenty-fourth volume with the July number. A portrait of Sir William Blackstone serves as frontispiece. Its pertinence is apparent to whosoever reads the leading article, "The Golden Age of Colonial New York." Mrs. Lamb has given a picture of the little metropolis of the province under kingly rule in 1768, conducting the curious

Publications received at Editor's Office,
June 16-28.

- BAZÁN, E. P. Russia: Its People and Its Literature. Tr. by Fanny Hale Gardiner. Chicago, A. C. McClurg & Co. 298 p. 16°. \$1.25.
- BELL, A. G. Memoir upon the Formation of a Deaf Variety of the Human Race. Washington, National Academy of Sciences. 86 p. 4°.
- CAMPBELL, D. H. Elements of Structural and Systematic Botany. Boston, Ginn & Co. 253 p. 12°. \$1.25.
- DEAF, Facts and Opinions relating to the. From America. London, Spottiswoode & Co. 1888. 195 p. 8°.
- DODEL, A. Instruction in Drawing in Primary and Intermediate Schools in Europe and America. With an Introduction by Louis Prang. Boston, New York, and Chicago, Prang Educ. Co. 35 p. 16°.
- FONTAINE, W. M. The Potomac or Younger Mesozoic Flora. Parts I. and II. Washington, Government. 377 p. 180 pl. 4°.
- FRASER, A. C. Locke. Philadelphia, Lippincott. 269 p. 16°. \$1.25.
- MINERALS, Catalogue of, for sale by Geo. L. English & Co. New York and Philadelphia. 100 p. 8°.
- NEWBERRY, J. S. The Paleozoic Fishes of North America. Washington, Government. 340 p. 4°.
- NEW YORK State Board of Charities, Annual Report of the, for the Year 1889. Albany, State. 411 p. 8°.
- NOLL, A. H. A Short History of Mexico. Chicago, A. C. McClurg & Co. 294 p. 16°. \$1.
- U. S. GEOLOGICAL SURVEY, Eighth Annual Report of the, to the Secretary of the Interior, 1886-87. Parts I. and II. Washington, Government. 1063 p. 4°.
- WENTWORTH, G. A. A School Algebra. Boston, Ginn & Co. 362 p. 12°. \$1.25.
- WHEELBARROW. Articles and Discussions on the Labor Question. Chicago, Open Court Publ. Co. 303 p. 12°. \$1.

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through its streets, houses, public buildings, and churches, to the commencement exercises of its college, to the founding of its Chamber of Commerce, to the king's legislative halls in Wall Street (with the governor, Sir Henry Moore, presiding), to the chamber of the City Corporation, and to the court-rooms, with descriptions of the men who figured in those places; while the newspapers, social affairs, amusements, shows, and quaint dress of the people are all depicted. Following this, Roy Singleton writes briefly of "Sir William Blackstone and his Work," the first volumes of which were already possessed by the principal lawyers of New York. "The Indian College at Cambridge," by Andrew McFarlane Davis, follows, with information on a subject little known; "Burgoyne's Defeat and Surrender, an Inquiry from an English Standpoint," by Percy Cross Standish, is interesting; "A Curious and Important Discovery in Indiana," by Ex-Lieut.-Gov. Robertson, gives a view of the links connecting the days of chivalry in France with those of adventure among the savage tribes of America; and then comes "President Lincoln's Humor," by David R. Locke. One of the most important papers in the number, however, is by the Boston divine, Rev. Samuel E. Herrick, D.D., entitled "Our Relation to the Past a Debt to the Future," which, although addressed to the people of Southampton, Long Island, may be taken home and appropriated by every community in the land.

—The number of the *American Journal of Psychology* just published (vol. iii. No. 2) contains the first chapter of the "History of Reflex Action," by Dr. C. F. Hodge, the introduction to which by Dr. G. Stanley Hall appeared in the last number. This important branch of both physiology and psychology is without an adequate historical treatment in English; and Eckhard's German treatise, published nine years ago, presents the subject almost exclusively from the standpoint of the physiologist. This chap-

ter brings the record down from Descartes into the present century, summarizing the contributions of Willis, Astruc of Montpellier, Whytt, Haller, Unzer, Prochaska, and Legallois. The history will be continued in succeeding numbers of the journal. Mr. E. A. Kirkpatrick contributes a paper of "Observations on College Seniors and Electives in Psychological Subjects," based upon statistics collected for Dr. Hall a few years ago by the professors of philosophy in several Eastern and two Western colleges. Questions were asked on the following heads: reason for electing such subjects, advantage already gained from such studies, authors found most impressive, most interesting subject treated in the course. While not admitting exact statistical treatment, the answers "form a composite portrait of the positions held, and the educational value of these studies from the student standpoint, of significance for teachers of these subjects. They have not only educational but anthropological significance, and reflect many sides and phases of mental evolution or psychogenesis which an ordinary examination-paper does not touch." Dr. E. C. Sanford describes "A Simple and Inexpensive Chronoscope," depending on the principle of the vernier, adapted from Kaiser. With the home-made instrument described, measurements were made to a hundredth of a second. It is, however, in reviews of "Psychological Literature" and "Notes," to which more than a hundred pages of fine print are devoted, that this number excels. Besides the usual section on the "Nervous System" (by Dr. H. H. Donaldson), on "Experimental Psychology," and on "Psychiatry" (by Dr. William Noyes), Dr. Arthur MacDonald presents a second instalment of reviews on the psychology of criminals, and Professor Julius Nelson continues his biological-psychological study of the literature of heredity and sex. A number of pages are also given to reports from colleges East and West, where the "new psychology" is taught, showing the work of the past year and the prospects for the future.

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CALENDAR OF SOCIETIES.

Royal Meteorological Society, London.

June 18.—W. Ellis, On the Difference produced in the Mean Temperature derived from Daily Maximum and Minimum Readings, as depending on the Time at which the Thermometers are read. In the publications issued by the Greenwich Observatory authorities, the maximum and minimum temperatures are those referring to the civil day from midnight to midnight. At many stations the observers only read their instruments once a day, viz., at 9 A.M., when the reading of the maximum thermometer is entered to the preceding civil day, and the reading of the minimum thermometer to the same civil day. Such stations are called "climatological stations." The author has tabulated the Greenwich maximum and minimum temperatures according to both methods for the years 1886-89, and finds that the climatological maximum and minimum means are in excess of the civil-day means. W. L. Dallas, On the Distribution of Barometric Pressure at the Average Level of the Hill Stations in India, and its Probable Effect on the Rainfall of the Cold Weather. The weather over India during January, 1890, was very dry, and in marked contrast to that which prevailed during January, 1889. The distribution of barometric pressure was, however, much the same in both months. The author has investigated the records at the hill stations, and has prepared charts showing the distribution of barometric pressure from both high and low level stations. From the high-level charts it appears that the mean barometric gradient in 1889 was rather more than twice that in 1890, and considering what is known of air movements, even at moderate elevations above the earth's surface, it may be assumed that these differences in pressure were accompanied with large differences of air motion; and, if it is also assumed that the evaporation over the Southern Ocean is in all years fairly comparable in amount, the deficiency of rainfall over India in the winter of 1889-90 can be attributed to diminished lateral translation of vapor, owing to sluggish movements in the upper atmosphere. W. Ellis, On the Relative Prevalence of Different Winds at the Royal Observatory, Greenwich, 1841-89. The author gives the following as the average number of days of prevalence of different winds for the forty-nine years 1841-89, as derived from the records of the self-registering Osler anemometer: north, 40 days; north-east, 45; east, 27; south-east, 22; south, 35; south-west, 106; west, 46; north-west, 22; calm, 22. A. B. MacDowall, On Some Recent Variations of Wind at Greenwich. J. P. Maclear, On the Action of Lightning during the Thunder-Storms of June 6 and 7, 1889, at Cranleigh. The author examined a number of trees which had been struck by lightning during these thunder-storms, and found that those which were struck before the rain fell were shattered, while those which were struck after the rain commenced were simply scored,

with the bark blown off. It seems that during rain every tree is conducting electricity, and a disruptive discharge takes place where the conductor becomes insufficient. This depends on the position of the cloud, the amount of foliage on the tree, its condition of moisture, and its connection with running water.

Natural Science Association of Staten Island.

June 12.—Mrs. N. L. Britton, A Preliminary List of the Mosses of Staten Island; Arthur Hollick showed dried specimens of *Clematis ochroleuca*, collected during the past month at Richmond; L. P. Gratacap presented a block of Potsdam sandstone, beautifully ripple-marked from the drift at the base of the bluff on the shore at Tottenville, also clay iron-stone containing plant-remains and nodules of pyrite from the same locality, and lignite from the clay beds near Kreischerville; Ira K. Morris, Some Old Staten Island Springs.

Engineers' Club, St. Louis.

June 18.—Charles C. Brown, River-Pollution in the United States.

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What are they? There is a new departure in the treatment of disease. It consists in the collection of the specifics used by noted specialists of Europe and America, and bringing them within the reach of all. For instance, the treatment pursued by special physicians who treat indigestion, stomach and liver troubles only, was obtained and prepared. The treatment of other physicians celebrated for curing catarrh was procured, and so on till these incomparable cures now include disease of the lungs, kidneys female weakness, rheumatism and nervous debility.

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For exchange—14 volumes (1883-1889) American Journal of Science, 10 volumes (1880-1889) American Naturalist, 21 volumes (1879-1890) English Mechanic, all in good condition for binding; also, Morris Typewriter. Wants first-class microscope, camera, chemical or physical apparatus. Address, with full particulars, E. R. Chadbourn, Lewiston, Maine.

Wanted.—To exchange land and fresh-water mollusca, (principally *Helices Achatinellae*, Clausilidae and Limnaeae,) for those not in my collection. Lists exchanged. Address E. H. White, Box 200, Astoria, Or.

Meteorites.—Mr. George F. Kunz, 11 to 15 Uni N Square, New York, or Hoboken, N. J., will buy or give in exchange for whole or parts of meteorites. Whole ones, undescribed ones, and entire falls especially desired.

Wanted.—To furnish roots of *Dodecatheon Meadia*, *Sarracenia purpurea*, and other wild flowers, native of Southern Wisconsin, in quantities. D. E. Willard, Curator of Museum, Albion Academy, Albion, Wis.

I have a number of duplicates of microscopic slides, mostly botanical, which I would like to exchange for others not now in my collection. Send list of what you have to exchange and get my list. S. R. Thompson, New Wilmington, Pa.

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PROTOPLASM AND LIFE.

By C. F. Cox. 12°. 75 cents.

The author of this book was for some years president of the New York Microscopical Society, and in this volume he sets forth his views on the spontaneous generation theory and its relation to the general theory of evolution, and on protoplasm and the cell doctrine.

Ready July 5.

THE CHEROKEES IN PRE-COLUMBIAN TIMES

By CYRUS THOMAS. 12°. \$1.

Dr. Thomas in this work will reverse the usual method of dealing with prehistoric subjects; that is to say, he will commence with the earliest recorded history of the tribe as a basis, and trace the chain back step by step by the light of the mounds, traditions, and other evidence, as far as possible. He has already presented to the public some reasons for believing the Cherokees were mound-builders, but additional evidence bearing on the subject has been obtained. A more careful study of the Delaware tradition respecting the Tallegwi satisfies him that we have in the Bark Record (Walam Olum) itself proof that they were Cherokees. He thinks the mounds enable us to trace back their line of migration even beyond their residence in Ohio to the western bank of the Mississippi. The object is therefore threefold: 1. An illustration of the reverse method of dealing with prehistoric subjects; 2. Incidental proof that some of the Indians were mound-builders; 3. A study of a single tribe in the light of the mound testimony. This work will be an important contribution to the literature of the Columbian discovery which will doubtless appear during the coming two years.

Ready at an early date.

THE TORNADO.

By H. A. HAZEN. 12°. \$1.

Professor Hazen is one of the prominent meteorologists connected with the United States Signal Office. In this work he reviews our present information as to tornadoes, severely criticising some of the opinions held in regard to them up to this time. No one has given a more careful study to these destructive storms than has Professor Hazen, and his book will prove a decided contribution to the world's knowledge. In this book will be found a careful discussion of the important question of Tornado Insurance now attracting so much attention. Hundreds of dollars may be saved by people who are thinking of such insurance by following the principles here made plain.

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